

Application No. 10/669,713
Attorney Docket No.: 031212
Amendment Under 37 C.F.R. § 1.111

REMARKS

Claims 1 and 3-5 are pending in the present application. Claim 1 is herein amended.

Claim Rejections - 35 U.S.C. § 112

Claim 1 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office Action states that the claim is unclear since the solvent may include 100 % of the main component, in which case the solvent cannot include a subsidiary component of cyclic ester carbonate or cyclic lactone. Claim 1 has been amended to recite that the main component is 90 % to less than 100 %.

Withdrawal of the rejection under § 112 is requested.

Claim Rejections - 35 U.S.C. § 103

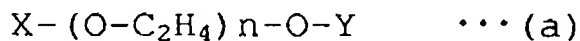
Claims 1 and 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Hamrock** (US Patent 6,063,522) in view of **Sano** (US 2002/0086191); and claims 1 and 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Hamrock** in view of **Sano** and **Funatsu** (US 5,478,673).

Hamrock discloses the use of diethylene glycol dimethyl ether. Sano discloses the use of a separator made of a substance capable of withstanding high temperatures (polyphenylene sulfide). Funatsu discloses a mixed solvent which comprises ethylene carbonate (cyclic carbonate) in an amount of 5 to 40% by volume and chain ethers in the amount of 60 to 95% by volume.

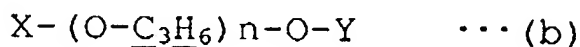
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Further, Funatsu describes "Examples of the chain ethers include dimethoxyethane, diethoxyethane, methoxyethoxyethane, dibutoxyethane, dimethoxypropane, diethoxypropane and methoxyethoxypropane." (See col. 6, lines 26-35.)

Dimethoxyethane, diethoxyethane, methoxyethoxyethane and dibutoxyethane are represented by the following formula (a). And dimethoxypropane, diethoxypropane and methoxyethoxypropane are represented by the following formula (b).

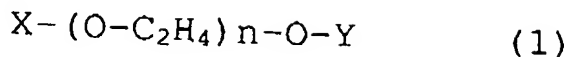


(where X and Y are independently an alkyl group with four carbons or less, and n is 1.)



(where X and Y are independently a methyl group or an ethyl group, and n is 1.)

These compounds are different from the compounds represented by formula (1) in claim 1 of the present application.



(where X and Y are independently a methyl group or an ethyl group, and n is 2 or 3.)

Claim 1 has been amended to clarify that the non-aqueous solvent has one or more than one main component and a subsidiary component. As acknowledged by the Office Action, Hamrock does not teach or suggest the use of a non-aqueous solvent having one or more than one main component and a subsidiary component. (Office Action, page 6.)

Withdrawal of the § 103 rejection based on Hamrock in view Sano is requested.

Applicants respectfully submit that the present invention as recited in the claims is non-obvious over Hamrock in view of Sano and Funatsu because the amount of the main and subsidiary components in the solvent of the present invention as recited in claim 1 is critical and provides unexpected results.

Claim 1 recites that the main component is 90 to less than 100 %, which means that the subsidiary component can be greater than 0 to 10 %.

The range of ethylene carbonate in the solvent of Funatsu (5 to 40 %) overlaps with the implicitly claimed range of the subsidiary component (0 to 10 %). However, the present specification points out that the use of the main and subsidiary components in the solvent in the claimed range provides unexpected results. (See specification, pages 15-16; Table 2.) Table 2 summarizes the results of using the main and subsidiary components within the claimed range (Examples 1-8) as opposed to being outside the claimed range.

When the main and subsidiary components of the solvent were used in an amount outside of the claimed range, (diethylene glycol dimethyl ether (“DGM”), 70 %; propylene carbonate (“PC”), 30 %), the cell swelling and relative discharging capacity were 3.25 % and 74 %, respectively. (Table 2, Comparative Example 5.) By contrast, when the main and subsidiary components of the solvent were used at the high end of the claimed range, (DGM, 90 %; PC, 10 %), the cell swelling and relative discharging capacity were 1.40 % and 82 %, respectively. (Table 2, Example 6.)

Further support demonstrating that the claimed range provides unexpected results is shown by the fact that even though the disclosed range of ethylene carbonate in the solvent of Funatsu overlaps with the claimed range, none of the specific examples in Funatsu use ethylene carbonate in an amount falling within the claimed range. (*See* Funatsu, Tables 1, 6, 8 and 9.)

The art of Funatsu relates to prevention of dendrite growth and to improvement of charge-discharge characteristics. The invention recited in claim 1 aims to improve the reliability under the severe circumstance of high temperature.

The selection and the mix ratio of the non-aqueous solvent in claim 1 is critical. Namely, the above-described composition of claim 1 improves long-term reliability and does not impair electrochemical property such as heat resistance and discharge characteristic even under the severe circumstance of high temperature.

Claim 1 provides unexpected results over the Hamrock in view of Sano and Funatsu. Thus, claim 1 is non-obvious over the cited references.

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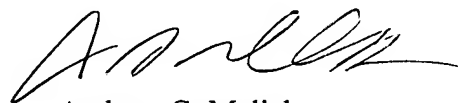
For at least the foregoing reasons, claim 1 is patentable over the cited references, and claims 3-5 are patentable by virtue of their dependence from claim 1. Accordingly, withdrawal of the rejection of claim 1 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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